

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) A reduced maintenance processing system for treating a substrate comprising:

a chemical treatment system for chemically altering exposed surface layers on the substrate using a first gas comprising  $\text{NH}_3$  and  $\text{HF}$ , wherein the chemical treatment system comprises a temperature controlled chemical treatment chamber having a protective barrier layer formed on at least a portion of an interior surface;

a thermal treatment system for thermally treating the chemically altered surface layers on the substrate, the thermal treatment system comprising a temperature controlled thermal treatment chamber having a protective barrier layer formed on at least a portion of an interior surface, wherein the thermal treatment system comprises a lifter assembly configured to vertically translate at least one substrate between a holding plane in an upper portion of the temperature controlled thermal treatment chamber and a temperature controlled substrate holder configured in a lower portion of the temperature controlled thermal treatment chamber, or a transfer plane located therebetween and the thermal treatment system further comprises a substrate detection system configured to determine when the at least one substrate is located in the holding plane, the thermal treatment system further comprising a lift pin assembly configured to vertically translate the substrate to and from an upper surface of the temperature controlled substrate holder to the transfer plane;

a first thermal insulation assembly coupled between the thermal treatment system and the chemical treatment system, the first thermal insulation assembly defining a common opening configured for transferring the substrate between the chemical treatment chamber and the temperature controlled thermal treatment chamber, when the at least one substrate is located in the holding plane; and

a second thermal insulation assembly coupled to the thermal treatment system, the second thermal insulation assembly having a transfer opening configured for transferring the substrate therethrough;

wherein the protective barrier layer on at least a portion of the interior surface of the chemical treatment system or the thermal treatment system comprises at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .

2. (Previously Presented) The processing system as claimed in claim 1, wherein the first thermal insulation assembly and the second thermal insulation assembly comprise a protective barrier layer on at least one exposed surface.

3. (Previously Presented) The processing system as claimed in claim 1, wherein: the chemical treatment system further comprises a second temperature controlled substrate holder mounted within the chemical treatment chamber and having a protective barrier layer formed on at least a portion of an exposed surface, a vacuum pumping system coupled to the chemical treatment chamber, and a gas distribution plate comprising a plurality of gas injection orifices and having a protective barrier layer formed on at least a portion of an exposed surface of the gas distribution plate and at least a portion of an exposed surface of each orifice, wherein the gas distribution plate is coupled to a temperature controlled gas distribution system for introducing a process gas into the chemical treatment chamber;

wherein the temperature controlled substrate holder configured in the lower portion of the temperature controlled thermal treatment chamber has a protective barrier layer formed on at least a portion of an exposed surface, and the thermal treatment system further comprises a vacuum pumping system coupled to the thermal treatment chamber; and

the processing system further comprises a control system coupled to the chemical treatment system and the thermal treatment system, and configured to control at least one of a chemical treatment chamber temperature, a chemical treatment gas distribution system temperature, a chemical treatment substrate holder temperature, a chemical treatment substrate temperature, a chemical treatment processing pressure, a chemical treatment gas flow rate, a thermal treatment chamber temperature, a thermal treatment substrate holder temperature, a thermal treatment substrate temperature, a thermal treatment processing pressure, and a thermal treatment gas flow rate.

4. (Withdrawn) The processing system as claimed in claim 1, wherein the protective barrier on the interior surface of the chemical treatment chamber comprises an anodized metal impregnated with PTFE and/or TFE.

5. (Withdrawn) The processing system as claimed in claim 4, wherein the protective barrier on the interior surface of the chemical treatment chamber comprises a hard anodized metal impregnated with TFE and/or PTFE.

6. (Withdrawn) The processing system as claimed in claim 4, wherein the metal comprises at least one of aluminum and an aluminum alloy.

7. (Previously Presented) The processing system as claimed in claim 1, wherein the protective barrier layer on the interior surface of the chemical treatment chamber comprises at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .

8. (Withdrawn) The processing system as claimed in claim 1, wherein the chemical treatment system further comprises a temperature controlled substrate holder having a protective barrier formed on at least a portion thereof, the protective barrier on the temperature controlled substrate holder mounted within the chemical treatment chamber comprising an anodized metal impregnated with PTFE and/or TFE.

9. (Previously Presented) The processing system as claimed in claim 1, wherein the chemical treatment system further comprises a temperature controlled substrate holder having a protective barrier layer formed on at least a portion thereof, the protective barrier layer on the temperature controlled substrate holder mounted within the chemical treatment chamber comprising at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .

10. (Withdrawn) The processing system as claimed in claim 1, wherein the chemical treatment system further comprises a gas distribution plate comprising a

plurality of gas injection orifices and having a protective barrier formed on at least a portion of an exposed surface of the gas distribution plate and at least a portion of an exposed surface of each orifice, wherein the gas distribution plate is coupled to a temperature controlled gas distribution system for introducing a process gas into the chemical treatment chamber, the protective barrier on the gas distribution plate and the protective barrier on each orifice comprises an anodized metal impregnated with PTFE and/or TFE.

11. (Withdrawn) The processing system as claimed in claim 10, wherein the protective barrier on the exposed surface of the gas distribution plate and the protective barrier on the exposed surface of each orifice comprises a hard anodized metal impregnated with TFE and/or PTFE.

12. (Withdrawn) The processing system as claimed in claim 10, wherein the metal comprises at least one of aluminum and an aluminum alloy

13. (Previously Presented) The processing system as claimed in claim 1, wherein the chemical treatment system further comprises a gas distribution plate comprising a plurality of gas injection orifices and having a protective barrier layer formed on at least a portion of an exposed surface of the gas distribution plate and at least a portion of an exposed surface of each orifice, wherein the gas distribution plate is coupled to a temperature controlled gas distribution system for introducing a process gas into the chemical treatment chamber, the protective barrier layer on the exposed surface of the gas distribution plate and the protective barrier layer on the exposed surface of each orifice comprises at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .

14. (Withdrawn) The processing system as claimed in claim 1, wherein the protective barrier on the interior surface of temperature controlled thermal treatment chamber comprises an anodized metal impregnated with PTFE and/or TFE.

15. (Withdrawn) The processing system as claimed in claim 14, wherein the protective barrier on the interior surface of the temperature controlled thermal treatment chamber comprises a hard anodized metal impregnated with TFE and or PTFE.

16. (Withdrawn) The processing system as claimed in claim 14, wherein the metal comprises at least one of aluminum and an aluminum alloy.

17. (Previously Presented) The processing system as claimed in claim 1, wherein the protective barrier layer on the interior surface of temperature controlled thermal treatment chamber comprises at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .

18. (Withdrawn) The processing system as claimed in claim 1, wherein the thermal treatment system further comprises a temperature controlled substrate holder mounted within the thermal treatment chamber and having a protective barrier formed on at least a portion of an exposed surface, the protective barrier on the exposed surface of the temperature controlled substrate holder mounted within the temperature controlled thermal treatment chamber comprises an anodized metal impregnated with PTFE and/or TFE.

19. (Previously Presented) The processing system as claimed in claim 1, wherein the temperature controlled substrate holder configured in the lower portion of the thermal treatment chamber has a protective barrier layer formed on at least a portion of an exposed surface, and the protective barrier layer on the exposed surface of the temperature controlled substrate holder configured in the lower portion of the temperature controlled thermal treatment chamber comprises at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .

20. (Previously Presented) The processing system as claimed in claim 1, wherein the first thermal insulation assembly and the second thermal insulation assembly

comprise a gate valve assembly, wherein a protective barrier layer is formed on at least a portion of an exposed surface of the gate valve assembly.

21. (Withdrawn) The processing system as claimed in claim 20, wherein the protective barrier on the exposed surface of the gate valve assembly comprises an anodized metal impregnated with PTFE and/or TFE.

22. (Previously Presented) The processing system as claimed in claim 20, wherein the protective barrier layer on the exposed surface of the gate valve assembly comprises at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .

23. (Withdrawn) The processing system as claimed in claim 10, wherein the process gas comprises a first gas and a second gas.

24. (Withdrawn) The processing system as claimed in claim 23, wherein the first gas comprises at least one of  $\text{NH}_3$ ,  $\text{HF}$ ,  $\text{H}_2$ ,  $\text{O}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$ ,  $\text{Ar}$ ,  $\text{He}$ , and  $\text{N}_2$ .

25. (Withdrawn) The processing system as claimed in claim 23, wherein the second gas comprises at least one of  $\text{NH}_3$ ,  $\text{HF}$ ,  $\text{H}_2$ ,  $\text{O}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$ ,  $\text{Ar}$ ,  $\text{He}$ , and  $\text{N}_2$ .

26. (Withdrawn) The processing system as claimed in claim 23, wherein the plurality of orifices comprises a first array of orifices for coupling the first gas to the process space and a second array of orifices for coupling the second gas to the process space.

27. Canceled

28. (Previously Presented) The processing system as claimed in claim 1, wherein the substrate lifter assembly comprises a blade having three or more tabs for receiving the substrate and having a protective barrier layer formed on at least a portion of an exposed

surface, and a drive system for vertically translating the substrate between the substrate holder, the holding plane, and a the transfer plane.

29. (Withdrawn) The processing system as claimed in claim 28, wherein the protective barrier on the at least one exposed surface of the blade comprises an anodized metal impregnated with PTFE and/or TFE.

30. (Previously Presented) The processing system as claimed in claim 28, wherein the protective barrier layer on the at least one exposed surface of the blade comprises at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .

31. Canceled

32. Canceled

33. Canceled

34. Canceled

35. Canceled

36. Canceled

37. Canceled

38. (Previously Presented) A thermal treatment system for thermally treating chemically altered surface layers on the substrate, the thermal treatment system comprising:

a temperature controlled thermal treatment chamber having a protective barrier layer formed on at least a portion of an interior surface;

a temperature controlled substrate holder configured in a lower portion of the thermal treatment chamber, wherein the temperature controlled substrate holder comprises a temperature control component, an underlying mating component, and a thermal insulation gap is configured to provide additional thermal insulation between the temperature control component and the underlying mating component;

a lifter assembly configured to vertically translate at least one substrate between a holding plane in an upper portion of the temperature controlled thermal treatment chamber and the temperature controlled substrate holder configured in the lower portion of the temperature controlled thermal treatment chamber, or a transfer plane located therebetween;

a substrate detection system configured to determine when the at least one substrate is located in the holding plane;

a lift pin assembly configured to vertically translate the substrate to and from an upper surface of the temperature controlled substrate holder to the transfer plane;

a vacuum pumping system coupled to the thermal treatment chamber;

a temperature controlled upper assembly coupled to the thermal treatment chamber;

a first thermal insulation assembly coupled to the temperature controlled thermal treatment chamber, the first thermal insulation assembly having a first opening configured for transferring the substrate between the temperature controlled thermal treatment chamber and a temperature controlled chemical treatment chamber, when the at least one substrate is located in the holding plane; and

a second thermal insulation assembly coupled to the temperature controlled thermal treatment chamber, the second thermal insulation assembly having a transfer opening configured for transferring the substrate between the temperature controlled thermal treatment chamber and a transfer system,

wherein the protective barrier layer on the interior surface of the thermal treatment chamber comprises at least one of  $\text{Sc}_2\text{O}_3$ ,  $\text{Sc}_2\text{F}_3$ ,  $\text{YF}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Eu}_2\text{O}_3$ , and  $\text{DyO}_3$ .



39. (Withdrawn) The thermal treatment system as claimed in claim 38, wherein the protective barrier on the interior surface of the thermal treatment chamber comprises an anodized metal impregnated with PTFE and/or TFE.

40. (Withdrawn) The thermal treatment system as claimed in claim 39, wherein the protective barrier on the interior surface of the thermal treatment chamber comprises a hard anodized metal impregnated with TFE and/or PTFE.

41. (Withdrawn) The thermal treatment system as claimed in claim 39, wherein the metal comprises at least one of aluminum and an aluminum alloy.

42. (Canceled)

43. (Previously Presented) The thermal treatment system as claimed in claim 38, wherein the temperature controlled substrate holder has a protective barrier layer formed on at least one exposed surface.

44. (Withdrawn) A method for treating a processing chamber, comprising: anodizing at least a portion of an interior surface of the processing chamber; and impregnating the anodized surface with PTFE and/or TFE, thereby creating a protective barrier.